Stoller
Hanford Office

HGLP-LDR-024

299-E25-54 (A6043)
Log Data Report

Borehole Information:

Borehole:	299-E25-54 (A6043)		Site:	216-A-7 Crib	
Coordinates (WA St Plane)		GWL[1] (ft):	None	GWL Date:	10/02/06
North	East	Drill Date	Elevation (ft) (TOC)	Total Depth (ft)	Type
136,043.477	575,512.443	03/55	680.6	150	Cable

Casing Information:

Casing Type	Stickup (ft)	Outer Diameter (in.)	Inside Diameter (in.)	Thickness (in.)	Top (ft)	Bottom (ft)
Welded steel	3.7	8 5/8	8	5/16	3.7	150

Borehole Notes:

Casing diameter and stickup measurements were acquired using a caliper and steel tape. Logging data acquisition is referenced to the top of casing (TOC).

Spectral Gamma Logging System (SGLS) Equipment Information:

Logging System:	Gamma 1E		Type:	SGLS (70%) SN: 34-TP40587A
Effective Calibration Date:	05/02/06	Calibration Reference:	DOE/EM-GJ1200-2006	
		Logging Procedure:	MAC-HGLP 1.6.5, Rev. 0	

Neutron Moisture Logging System (NMLS) Equipment Information:

Logging System:	Gamma 2M		Type:	NMLS SN: H340207279
Effective Calibration Date:	08/02/06	Calibration Reference:	DOE/EM-GJ1283-2006	
		Logging Procedure:	MAC-HGLP 1.6.5, Rev. 0	

Spectral Gamma Logging System (SGLS) Log Run Information:

Log Run	1	2	3 Repeat		
Date	10/03/06	10/05/06	10/05/06		
Logging Engineer	McClellan	McClellan	McClellan		
Start Depth (ft)	3.0	111.0	18.0		
Finish Depth (ft)	112.0	153.0	3.0		
Count Time (sec)	100	100	100		
Live/Real	R	R	R		
Shield (Y/N)	N	N	N		
MSA Interval (ft)	1.0	1.0	1.0		
ft/min	N/A[2]	N/A	N/A		
Pre-Verification	AE198CAB	AE199CAB	AE199CAB		
Start File	AE198000	AE199000	AE199043		
Finish File	AE198109	AE199042	AE199058		
Post-Verification	AE198CAA	AE199CAA	AE199CAA		
Depth Return Error (in.)	1.0 HIGH	N/A	2.5 HIGH		

Log Run	1	2	3 Repeat		
Comments	No fine-gain adjustment	No fine-gain adjustment	No fine-gain adjustment. Repeat section.		

Neutron Moisture Logging System (NMLS) Log Run Information:

Log Run	5	6	7 Repeat		
Date	10/09/06	10/09/06	10/09/06		
Logging Engineer	Spatz	Spatz	Spatz		
Start Depth (ft)	4.0	103.0	8.0		
Finish Depth (ft)	104.0	154.75	23.0		
Count Time (sec)	15	15	15		
Live/Real	R	R	R		
Shield (Y/N)	N	N	N		
MSA Interval (ft)	0.25	0.25	0.25		
ft/min	NA	NA	NA		
Pre-Verification	BM012CAB	BM012CAB	BM012CAB		
Start File	BM012000	BM012401	BM012601		
Finish File	BM012400	BM012600	BM012661		
Post-Verification	BM012CAA	BM012CAA	BM012CAA		
Depth Return Error (in.)	N/A	N/A	0.5 HIGH		
Comments	None.	Subdirectory change.	Repeat section.		

Logging Operation Notes:

Logging was conducted with a centralizer on the sonde for both SGLS and NMLS logging. Repeat sections were collected with the SGLS and NMLS to evaluate the logging systems' performances.

Analysis Notes:

Analyst:	Pope	Date:	11/01/06	Reference:	GJO-HGLP 1.6.3, Rev. 0

Pre-run and post-run verifications for the logging systems were performed before and after the day's data acquisition. Acceptance criteria were met for the verification spectra for the SGLS. NMLS count rates from both the pre- and post-run verification measurements were approximately 15% above the upper-control limits, but within HASQARD limits. The spectra exhibit typical character and are accepted.

SGLS spectra were processed in batch mode using APTEC SUPERVISOR to identify individual energy peaks and determine count rates. Concentrations were calculated using the EXCEL worksheet template identified as G1EMay06.xls. A casing correction for 0.3125-in. thick casing was applied to the SGLS.

NMLS spectra were processed in batch mode using APTEC SUPERVISOR to determine count rates. Moisture volume percents were calculated using the EXCEL worksheet template identified as G2MAug06.xls, using calibration values for 8-in. casing.

Results and Interpretations:

A continuous zone of ^{137}Cs was detected from 10 to 14 ft. A zone of high ^{137}Cs concentrations exists from approximately 11 to 12 ft. The maximum concentration is approximately 600 pCi/g at 12.0 ft. ^{137}Cs is also detected at 40, 76, and 153 ft, though further review of the spectra at these depths suggests these are spurious detections.

^{154}Eu was not identified during the main log event, but was identified during the repeat log event. The repeat log had a depth return error of 2.5 in. (~0.2 ft), and a depth correction was applied. It appears that the ^{154}Eu is approximately coincident with ^{137}Cs, but at substantially lower concentrations. ^{154}Eu was detected only at 11.8 and 12.8 ft, with a maximum concentration of about 1 pCi/g at 11.8 ft. The 1274.44 keV energy peak was used to assay this isotope. Other gamma peaks were not observed in the spectrum, probably due to the low concentration and the high ^{137}Cs concentration. ^{154}Eu may exist at a higher concentration at the 12 ft depth, but cannot be resolved due to the high concentration of ^{137}Cs.

^{60}Co was identified at 35 ft at a concentration of 0.06 pCi/g, just above the MDL (0.04 pCi/g). The 1333 keV energy peak was used to assay cobalt. The 1173 keV energy peak was not identified during analysis, but was visually observed to be a weak peak in the spectrum.

Gamma activity from natural uranium is usually dominated by emissions from ^{238}U daughters such as ^{226}Ra, ^{214}Pb, and ^{214}Bi. These isotopes occur in the lower part of the decay chain and achieve secular equilibrium with the parent ^{238}U over a time frame approaching a million years. Processed uranium refers to material that has been chemically purified. The purification process removes the daughter elements and thus manmade uranium can be differentiated from natural uranium by the absence of gamma rays from long-term daughters combined with the presence of less intense gamma rays from short-term daughters.

The primary gamma activity associated with manmade uranium originates from ^{234m}Pa. The 1001-keV gamma ray is the most intense (0.84% yield), and a confirming peak occurs at 766 keV (0.29% yield). These lines are seldom strong enough to be detected in natural uranium at background levels, but can be detected when manmade uranium concentrations exceed 10 pCi/g. Natural uranium is most commonly detected and quantified from gamma rays at 1764 or 609 keV (yields of 15.4% and 44.8%, respectively), at levels below 1 pCi/g. These gamma rays originate from ^{214}Bi, which is far down in the decay series and therefore not present in detectable amounts in manmade uranium.

Processed uranium exists from 38 to 42 ft, and at 28 and 34 ft in this borehole, with a maximum concentration of about 18 pCi/g at 39 ft. The MDL averages about 9 to 10 pCi/g. Processed uranium in this borehole was identified using the 1001 keV gamma ray of ^{234m}Pa. Supporting lines at 766 keV were not identified during analysis, but were observed as small peaks above background during visual inspection of the spectra.

Westinghouse Hanford Company logged this borehole in 1999 with the Radionuclide Logging System (RLS) with both a neutron-moisture gauge and an HPGe spectral-gamma detector. ^{137}Cs, ^{60}Co, ^{154}Eu, and elevated ^{238}U were identified during spectral-gamma logging. Concentrations of all isotopes identified by the RLS, and decayed to 2006, show good agreement with the current SGLS measurements. Comparison of gross-gamma plots and moisture plots from 1999 and 2006 suggest no changes in the gamma or moisture profiles of this borehole since 1999.

The repeat section for the SGLS indicates good agreement for manmade and natural isotopes, and gross-gamma. The repeat section for the NMLS indicates good agreement with the main log.

List of Plots:

Man-Made Radionuclides
Natural Gamma Logs
Combination Plot
Total Gamma, Dead Time, & Moisture
SGLS/RLS Manmade Comparison
SGLS/RLS Gross-Gamma & Moisture Comparison
Repeat Section for Manmade Radionuclides
Repeat Section of Natural Gamma Logs

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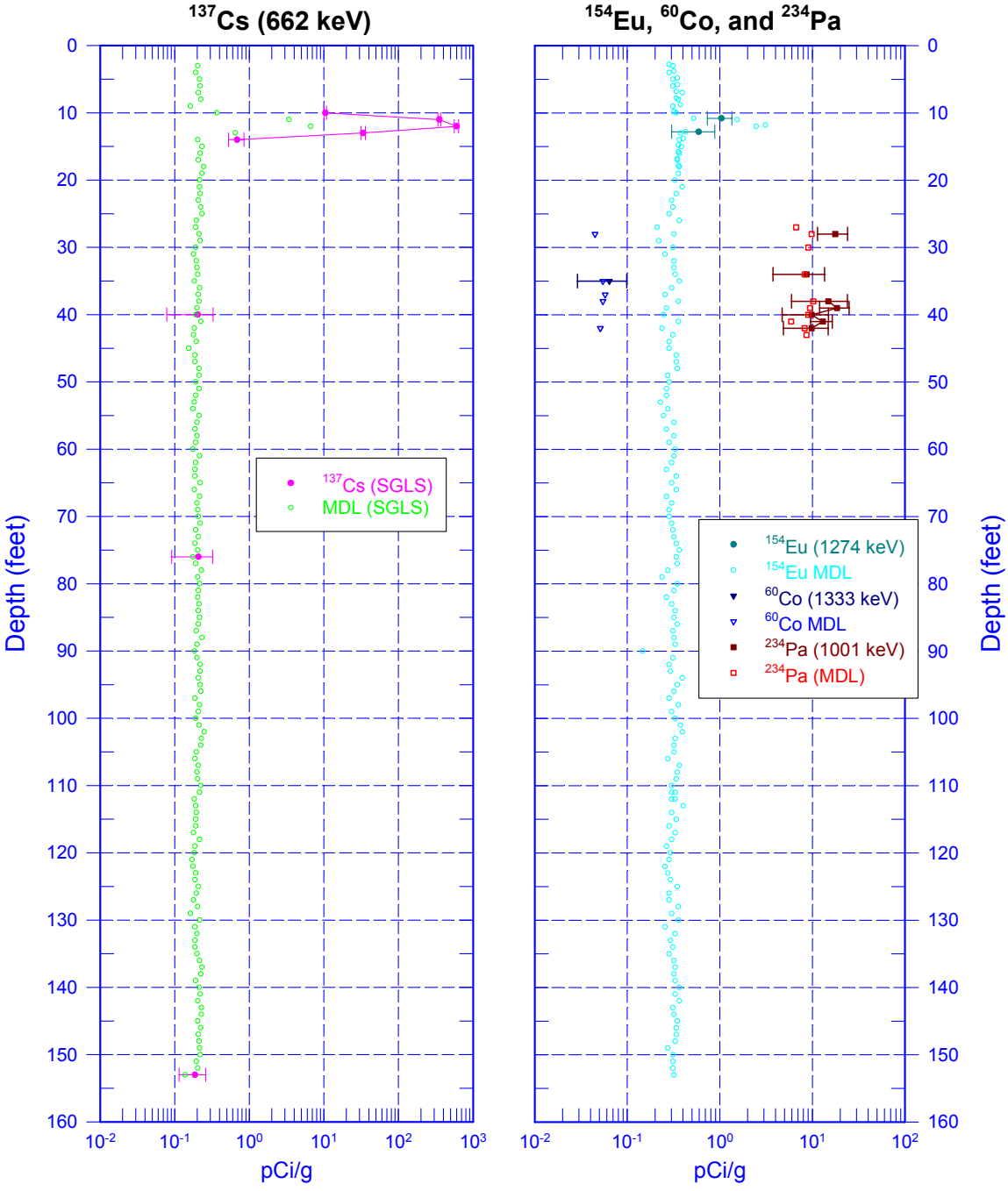
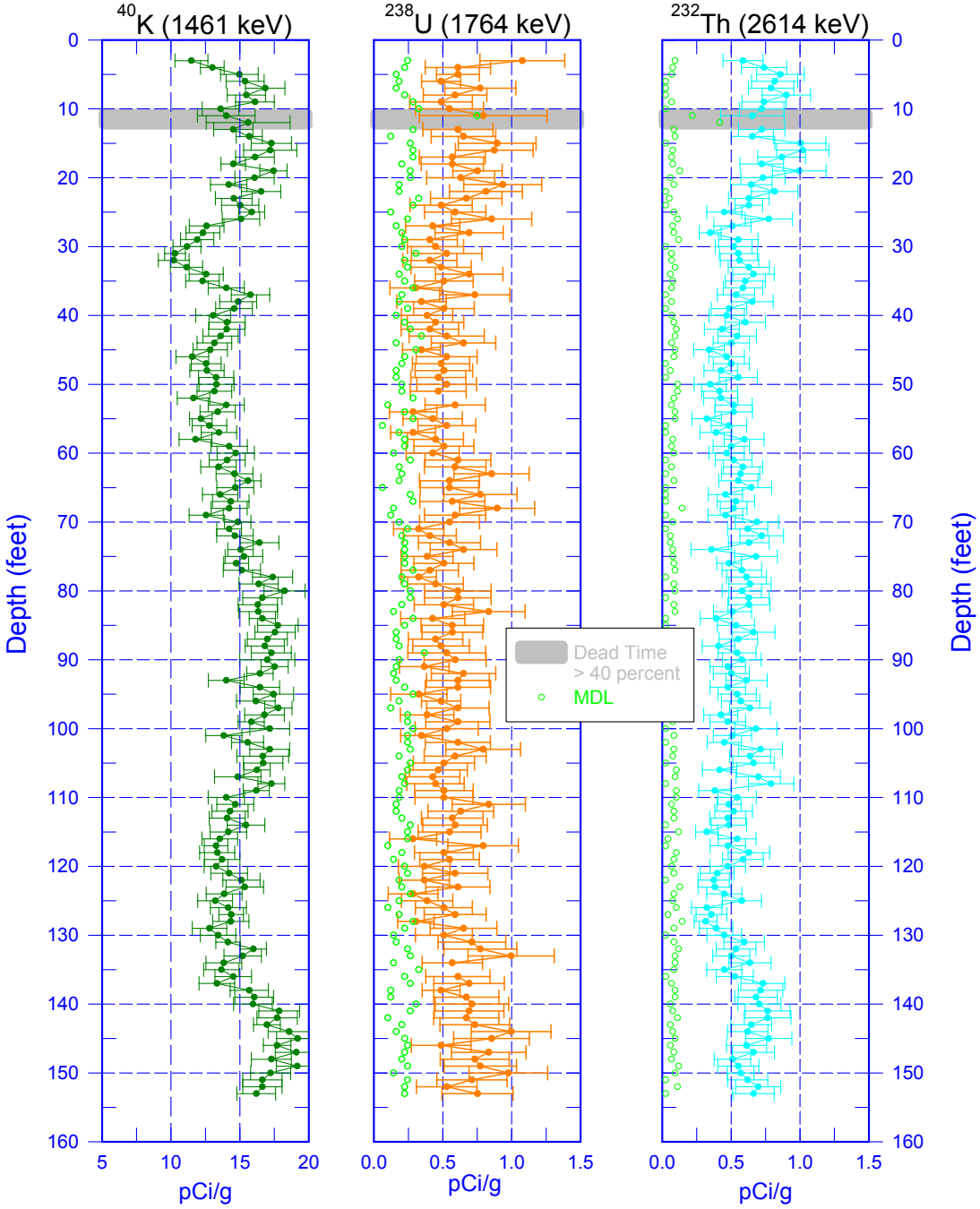
[1] GWL – groundwater level
[2] N/A – not applicable

299-E25-54 (A6043)
Man-Made Radionuclides



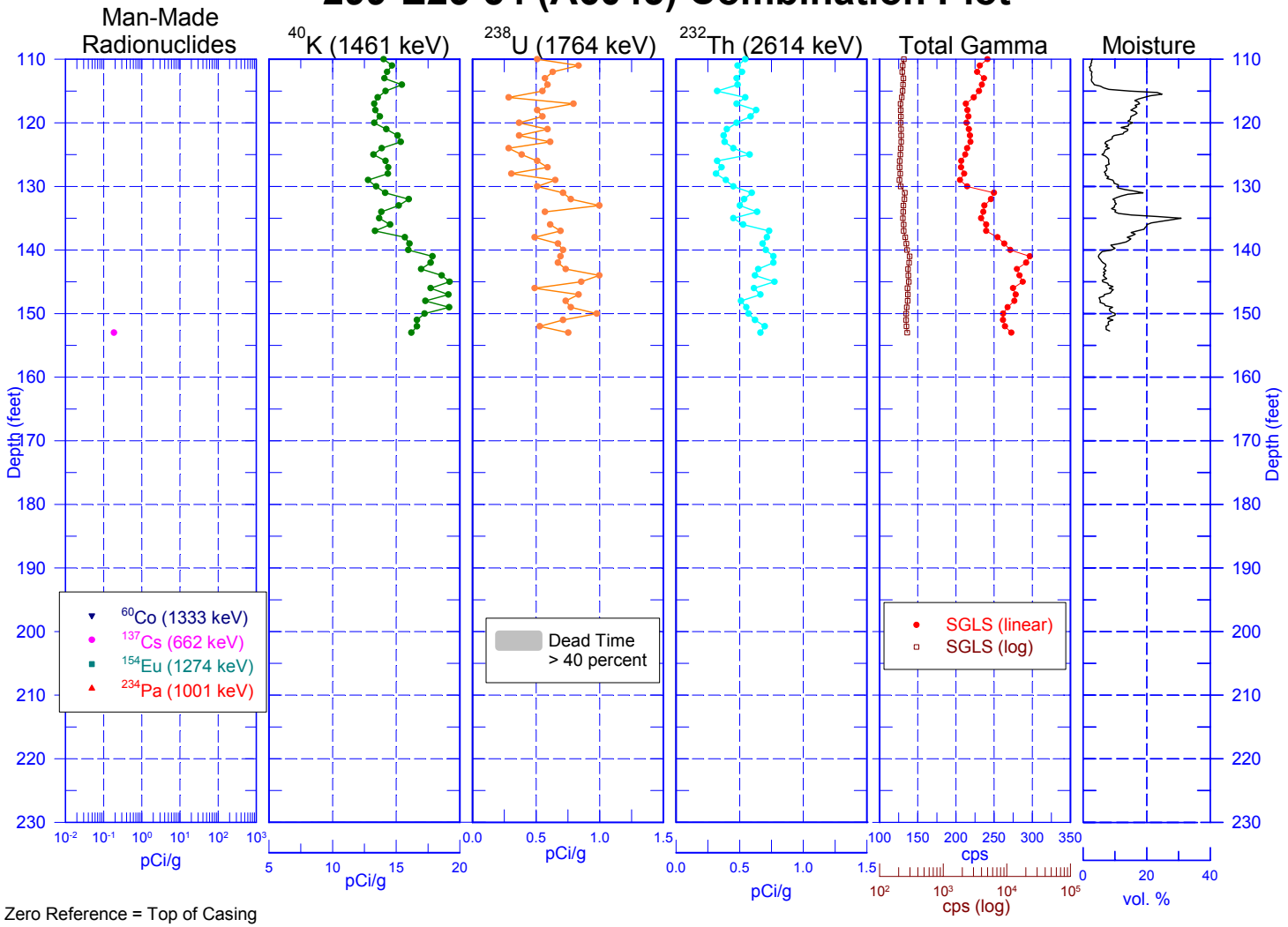
Zero Reference = Top of Casing

299-E25-54 (A6043)
Natural Gamma Logs



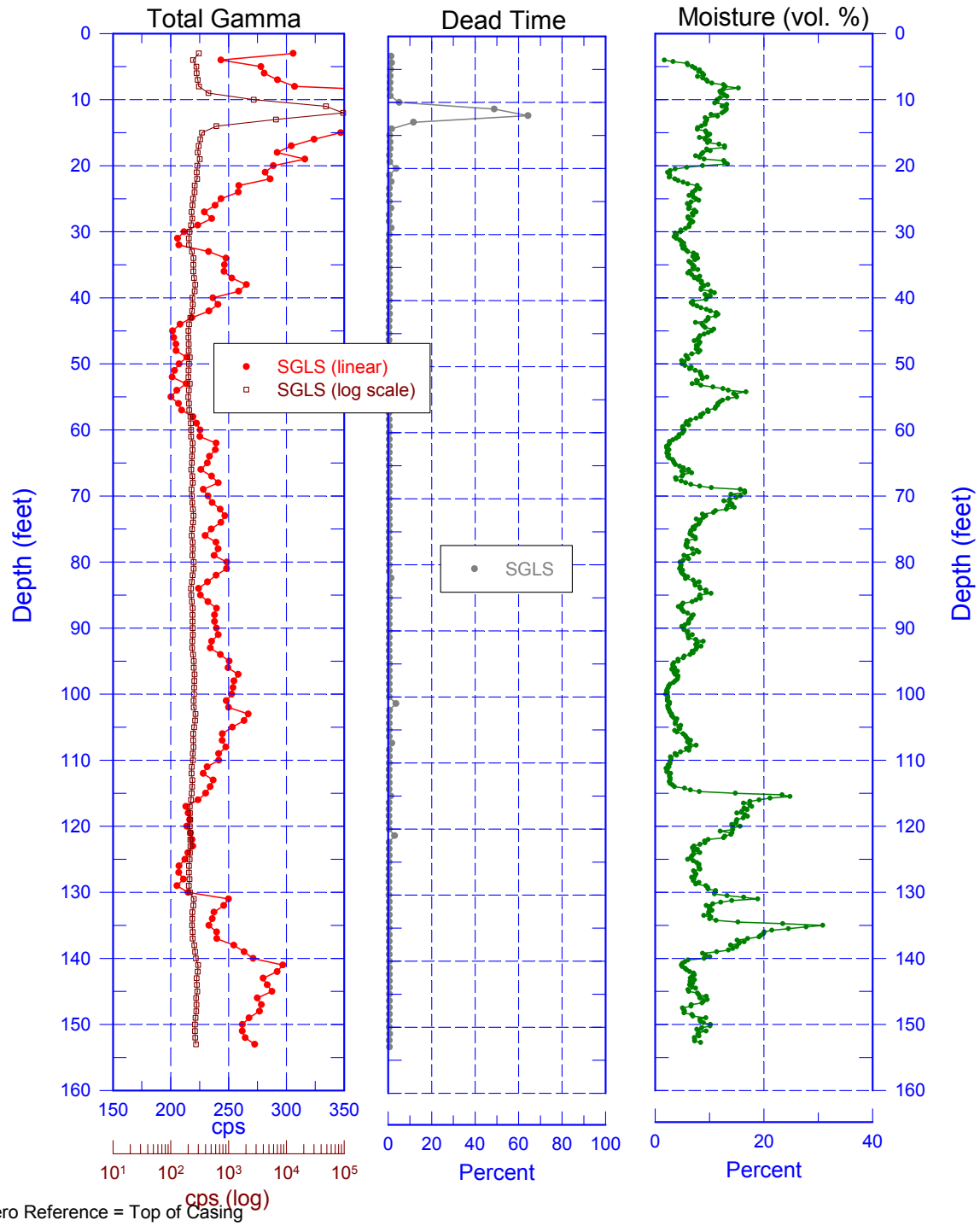
Zero Reference = Top of Casing

299-E25-54 (A6043) Combination Plot



Zero Reference = Top of Casing

299-E25-54 (A6043)
Total Gamma, Dead Time, & Moisture



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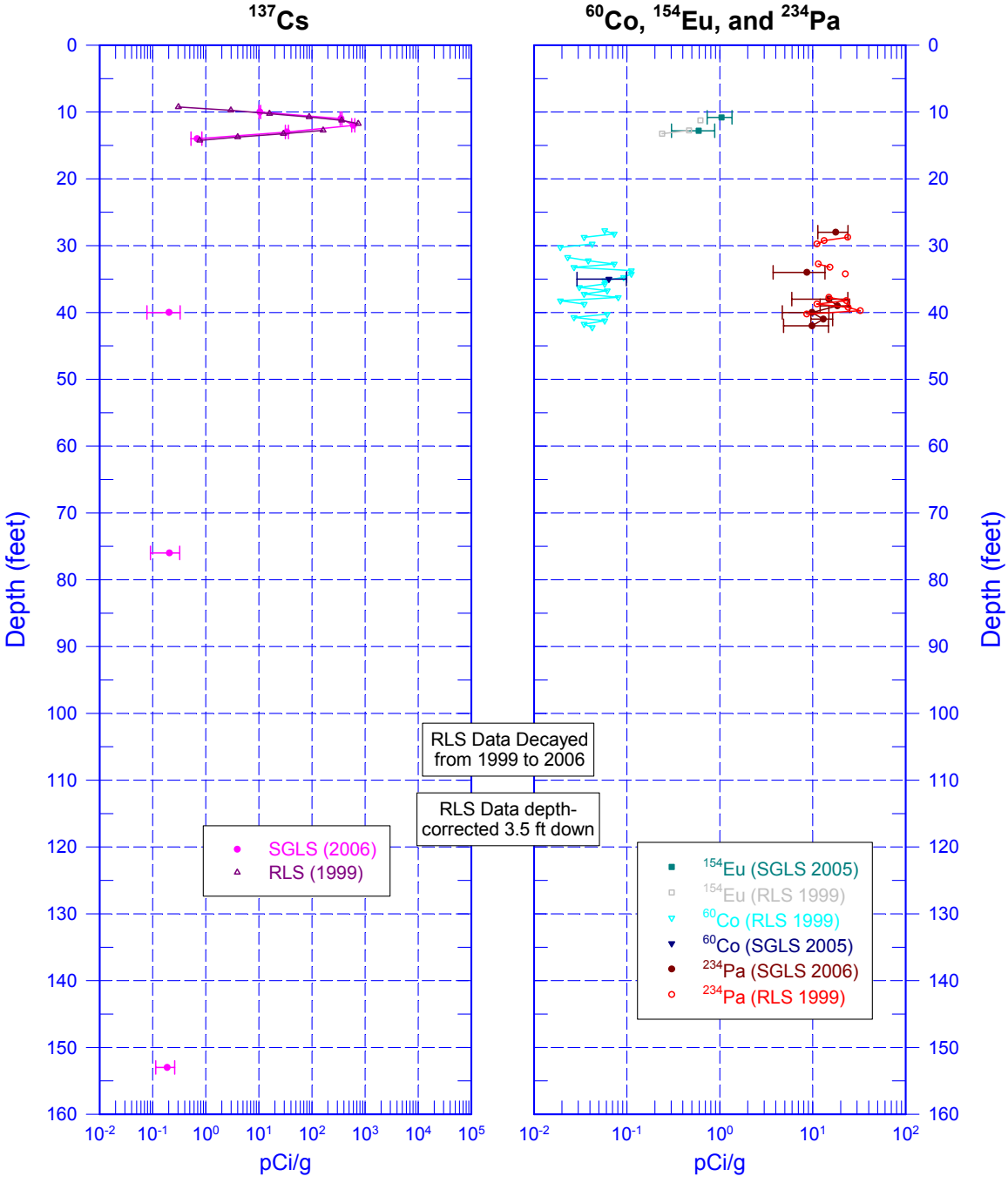
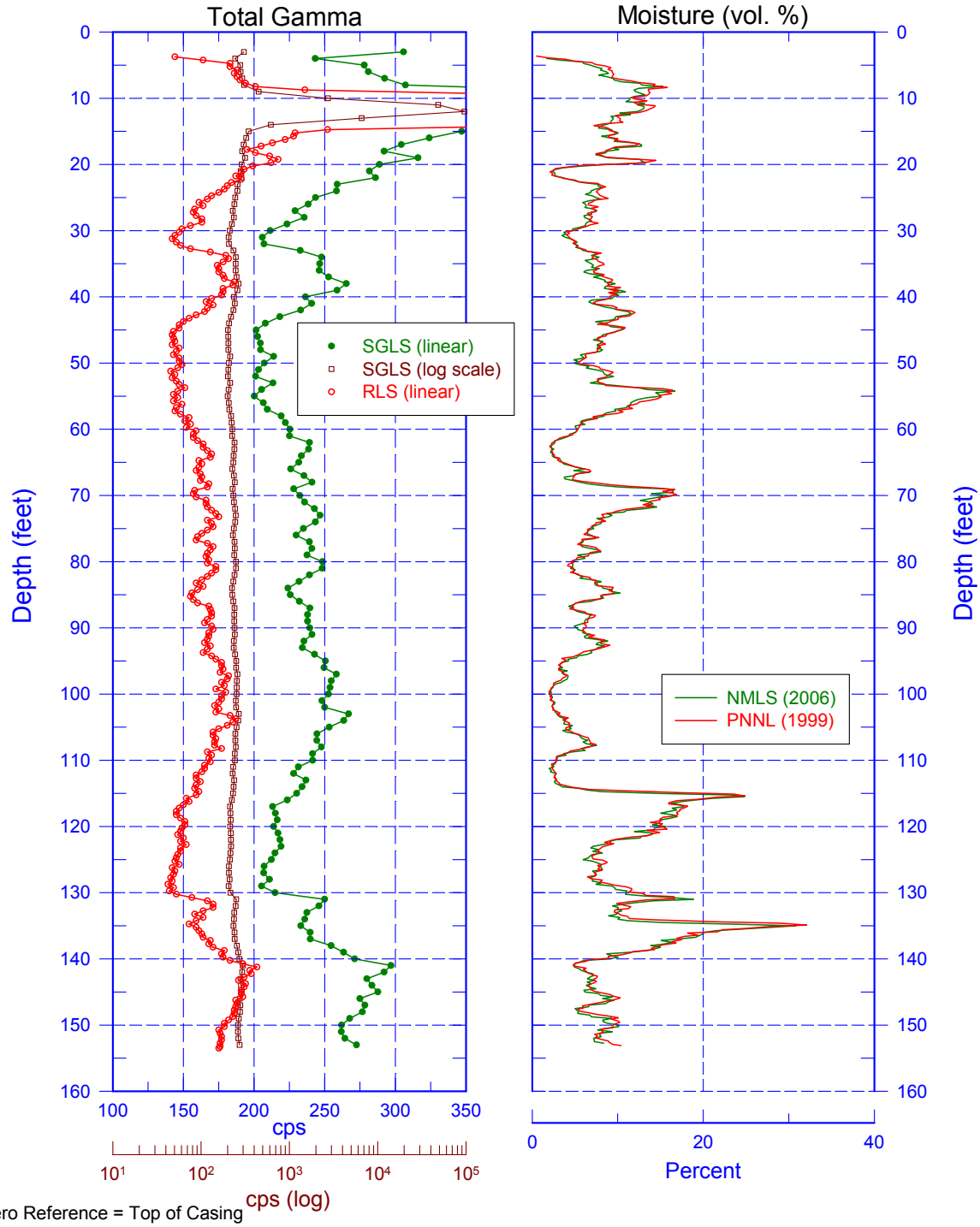
SGLS & RLS Man-Made Radionuclide Comparison



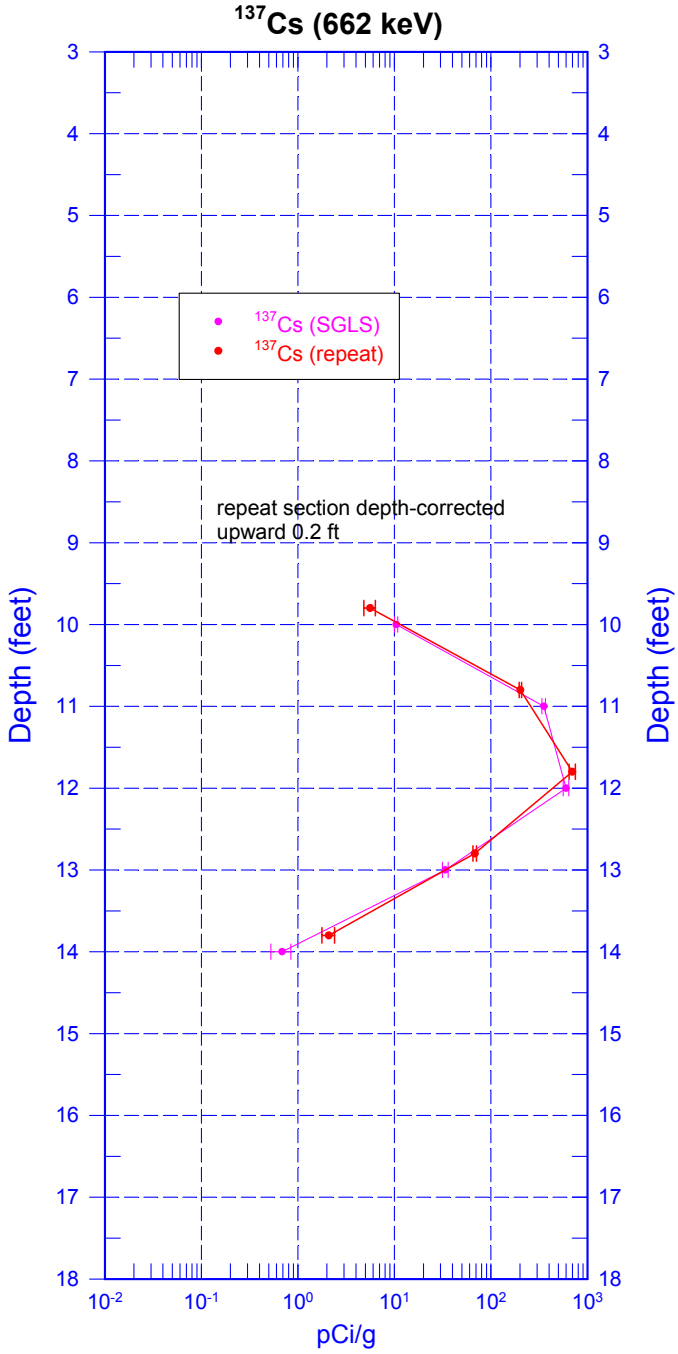
Zero Reference = Top of Casing

299-E25-54 (A6043)
SGLS-RLS Total Gamma & Moisture Comparison



Zero Reference = Top of Casing

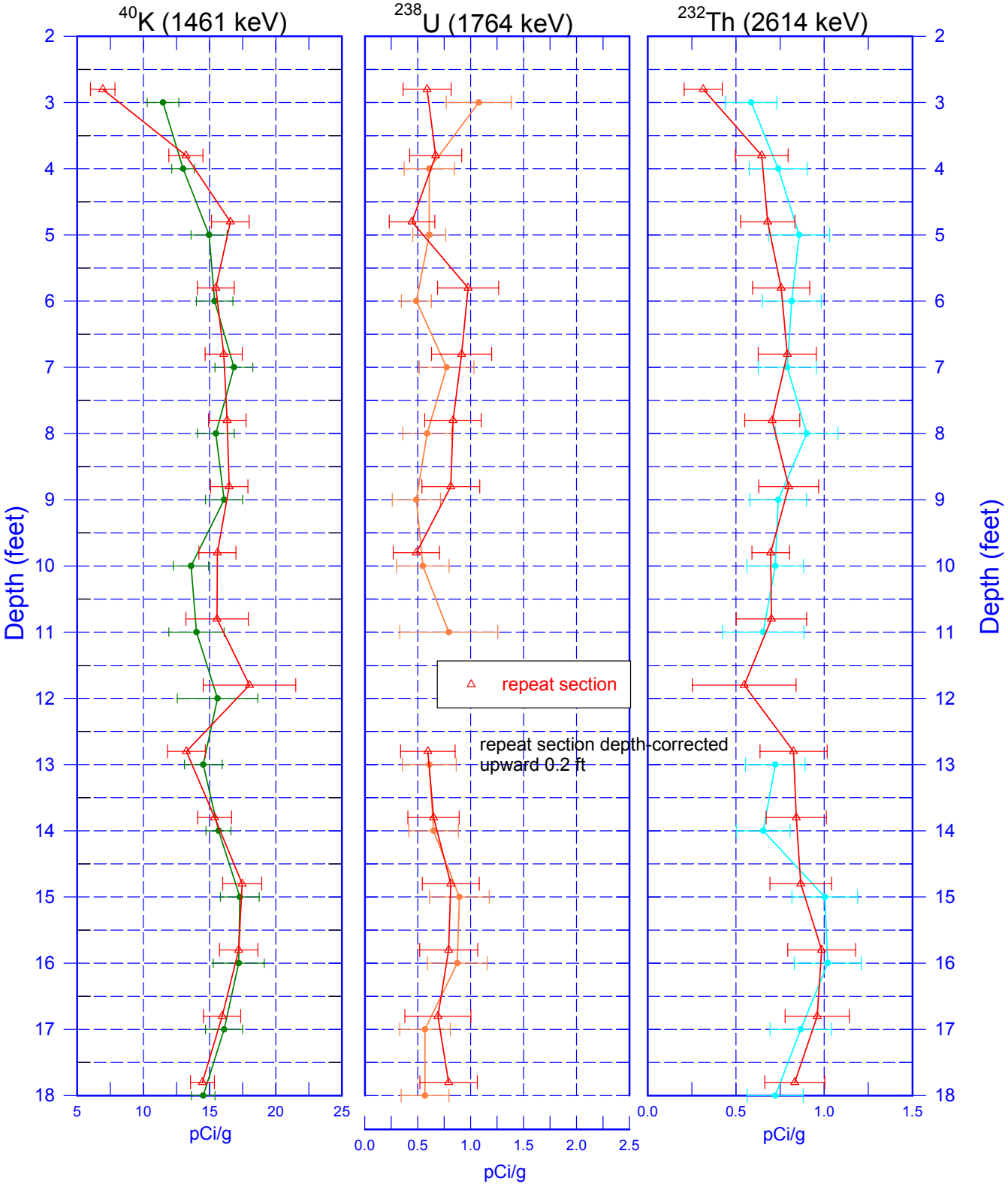
299-E25-54 (A6043)
Repeat Section of Man-Made Radionuclides



Zero Reference = Top of Casing

299-E25-54 (A6043)

Repeat Section of Natural Gamma Logs



Zero Reference = Top of Casing